

Claims

1. A separation device for the separation of constituents of different density of well fluids from a well, the separation device including a container, a feed line transporting the fluid into the container, the fluid at least partially being separated in the container into its constituents using centrifugal force in the radial direction and / or using gravitational force in the vertical direction, the separation device further including

a classifier device arranged in a lower section of the container having at least one discharge line extending in the radial direction outwards for the discharge of the fluid into the container and a plurality of delivery lines joined to the container at different levels in the vertical direction for the separated fluid constituents.

2. The separation device according to claim 1, wherein the discharge line is in a generally spiral shape at least adjacent to its discharge opening .

3. The separation device according to claim 1, wherein the discharge line extends from a vertical pipe of the classifier device arranged centrally in the container.

4. The separation device according to claim 3 wherein a fluid line terminates within the vertical pipe and the fluid enters the discharge line from within the vertical pipe.

5. The separation device according to claim 3 wherein the vertical pipe is subdivided in the longitudinal direction into a plurality of pipe sections separated from one another, the fluid feed line terminating in a first lower pipe section and each of the further pipe sections above the first pipe section having at least one of the delivery lines communicating with the each of the further pipe sections .

6. The separation device according to claim 3 further including openings formed in a pipe casing of the vertical pipe at least in the region of the further pipe sections.

7. The separation device according to claim 5 wherein a length of the pipe sections is variable.

8. The separation device according to claim 5 wherein the pipe sections are separated by intervening bottoms.
9. The separation device according to claim 3 including two discharge lines extending from the vertical pipe and being generally coil shaped radially outwards and extending vertically upwards.
10. The separation device according to claim 1 wherein the discharge line has a number of openings on its outer side, generally in the radial direction.
11. The separation device according to claim 3 wherein the classifier device has at least one blade segment protruding radially outwards from the vertical pipe.
12. The separation device according to claim 11 wherein the blade segment has openings for the accommodation and / or mounting of the discharge line.
13. The separation device according to claim 12 wherein the openings are arranged along a radial outer end section of the blade segment.
14. The separation device according to claim 13 wherein the openings are formed as a partially open edge recess of the blade segment.
15. The separation device according to claim 3 wherein the container has a bottom plate enclosing the vertical pipe with outlet openings for at least the fluid constituent with the greatest density.
16. The separation device according to claim 3 wherein the delivery lines within the vertical pipe have generally vertically extending line sections which are connected to at least one rotary slide valve.
17. The separation device according to claim 16 wherein the line sections following the rotary slide valve and using a multibore connector can be connected to transport lines for the further transport of the constituents of the well fluids.

18. The separation device according to claim 17 wherein the fluid feed line is connected via the rotary slide valve and multibore connector to a well fluids line which feeds the well fluids from the well.
19. The separation device according to claim 17 wherein a flow control valve is arranged in the transport line.
20. The separation device according to claim 19 wherein a throttle device and / or a metering valve follows the flow control valve.
21. The separation device according to claim 5 wherein at least one level sensor is assigned to each pipe section.
22. The separation device according to claim 3 wherein at least one sensor device is disposed in an upper end of the container and / or the vertical pipe.
23. The separation device according to claim 1 further including at least one feedback line disposed between the separation device and the well.
24. The separation device according to claim 1 wherein the separation device is a replaceable as part of a tree on the sea bed.
25. The separation device according to claim 1 wherein the separation device has a frame structure for mounting at least the container, lines, pumps, valves, throttles or similar equipment.
26. The separation device according to claim 1 wherein the separation device is connected to an electrical supply and control unit positioned adjacent the container.
27. The separation device according to claim 1 further including at least one changeover valve arranged in the well fluids feed line.

28. The separation device according to claim 1 further including a bypass pipeline that branches from the well fluids feed line.
29. The separation device according to claim 1 wherein the container is essentially spherical or silo-shaped.
30. The separation device according to claim 1 wherein the container is of modular construction.
31. A separator for separating the constituents of well fluids from a well, the separator comprising:
 - a container housing a plurality of spiral tubes having at least one inlet and selected outlets;
 - said at least one inlet receiving the well fluids and using centrifugal force in the radial direction to separate the constituents which exit the selected outlets;
 - the constituents separating using gravitational force at different vertical levels in the container in accordance with their different densities;
 - a plurality of discharge compartments arranged vertically within the container in accordance with the densities of the constituents; and
 - each discharge compartment communicating with a discharge pipe for removing a constituent from the container.
32. The separator of claim 31 wherein the container is integrated with a subsea tree.
33. The separator of claim 31 wherein the constituents include sand, water, and gas and further including a reinjection tree communicating with the discharge pipes whereby such constituents are reinjected into a reinjection well.
34. The separator of claim 32 further including rotary slide valves for controlling flow through the discharge lines.
35. The separator of claim 34 wherein the rotary slide valves are actuated electrically subsea.